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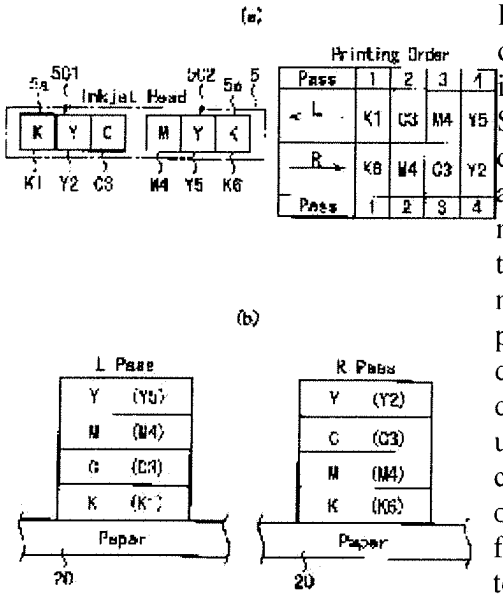
(54) INK-JET PRINTER

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent a color tone change by a color overlap order when two way printing is carried out in an ink-jet printer.
SOLUTION: A plurality of at least one of nozzles for discharging inks of a darkest color, a lightest color and an intermediate color of these colors are set as ink-jet nozzles of an ink-jet head of this ink-jet printer. When the ink-jet head moves in any horizontal direction, nozzles for discharging the lightest color ink are positioned to the downstream of the nozzles for discharging the intermediate color ink, or nozzles for discharging the darkest color ink are positioned to the upstream of the nozzles for discharging the intermediate color ink. Printing with always maintaining the overlap order of inks at positions where the same dots are to be formed is thus enabled, and band mottle and the color tone change can be effectively prevented.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the ink jet printer from which color tone change of the contiguity swath at the time of performing especially bidirectional printing (the so-called band) is reduced and removed about the ink jet printer designed in order to print a color picture using the color defined by the subtractive-color-mixture color model.
[0002]
[Description of the Prior Art] Methods, such as an ink jet type, a laser beam type, a sensible-heat type, and a hot printing type, are learned as a raster plotter conventionally used as the printer used as output units, such as a computer and a word processor, or an output unit of a CAD system.
[0003] In it, an ink jet-type printer can be printed from a print head by the ability breathing out ink to a print sheet etc., and can print a high definition image etc. at high speed. Most this ink jet printer for printing the image with which it generally spread through first in a roll widely, and especially the computer processed the color printer of the type which carries out the regurgitation of the ink of **** to the spread of computers in recent years from a print head conjointly with multicolor many gradients is used.
[0004] In such an ink jet printer, printing is performed by sending a record form in the direction (the direction of vertical scanning) which intersects perpendicularly with a main scanning direction, moving a print head in the direction (main scanning direction) which crosses a record form, and printing the range which can be printed by one scan. Generally a print head consists of two or more head segments located in a line with the main scanning direction, and each head segment is prepared corresponding to the color of each ink. Each head segment is equipped with two or more nozzles which changed the location of the direction of vertical scanning. Color printing follows a subtractive-color-mixture model. A subtractive-color-mixture model is typically expressed with the combination (CMYK) which added black (K) ink to the combination (CMY) of cyanogen (C), a Magenta (M), and yellow (Y) ink, and this combination. Moreover, in addition to CMYK, the combination of a thin Magenta (Light Magenta:LM), thin cyanogen (Light Cyan:LC), thin black or such combination, and spot color, such as a vermilion, green, red, and blue, etc. is known as a subtractive-color-mixture model as an extended edition of such combination.
[0005] The present most general print head configuration of an ink jet printer is 4 head segment configuration of 1 head segment per color, for example, when one-way printing is carried out, black (K) ink adheres to a print sheet first, subsequently to a it top cyanogen (C) and Magenta (M) ink are breathed out, and the printer head by which the nozzle configuration was carried out in the sequence of KCMY so that yellow (Y) ink might finally adhere is adopted.
[0006] In order to shorten printing time amount compared with one-way printing, when carrying out bidirectional printing, contrary to the time of a **** scan, yellow (Y) ink adheres first, a Magenta (M) and cyanogen (C) ink will adhere on it, finally black (K) ink will adhere, and the printing swath at the time of a double-acting scan will be made from this print head.
[0007] In this way, in the image quality of the result obtained by bidirectional printing, color

tone change is noticeable between contiguity swaths. It is because the swath by which the reason was printed in order of KMCY ink looks bright to human being's eyes rather than the swath printed in order of YMCK. This fact is drawn from having the lightness from which extent which four colors of the criterion used for subtractive color mixture can identify by human being's eyes, respectively differs.

[0008] It thinks based on the knowledge of being made by subtractive-color-mixture processing in which the optimal color reproduction by the printing approach of the order of KCMY makes the black (K) of the darkest color adhere to a print sheet first, and makes the cyanogen (C) of a color brighter than black adhere on it. For example, in the case of 6 color printing system which added LC and LM to KCMY, it can consider making these two newly applied colors adhere ahead of Y as sequence of the ink layer for the optimal color reproduction.

[0009] By the way, in order to heighten goods competitive strength, meeting a quick shipment demand of a commercial scene, the price fall demand, etc., the balance of the image quality which it is the printing time amount in an ink jet printer and as a result of [its] printing must be considered. Therefore, many ink jet printers have equipped bidirectional printing mode standardly, and can decrease in number printing time amount 25% to 30% in that case compared with an one-way print mode.

[0010]

[Problem(s) to be Solved by the Invention] However, although surely the printing approach in bidirectional printing mode shortens printing time amount, the increment in a print speed will be attained by usually sacrificing image quality, will generate the so-called band spots as a stripe which is conspicuous through the whole image or a part, and will spoil image quality as a result. Although the band spots in this phenomenon can be reduced by printing by interleave, the problem of being completely unremovable has them.

[0011] Here, the contents are explained using drawing 9 A - 9C. This drawing is drawing which expressed the logical model in the case of carrying out interleave printing by horizontal resolution 360dpi using the print head to which the dot was perpendicularly located in a line at intervals of 1/180 inch. First, as shown in drawing 9 A, when the print head 100 ****** in the 1st direction (drawing Nakaya mark R1 direction), the ink nozzle 101 carried in the print head 100 injects ink, and carries out printing of horizontal resolution 360dpi and vertical definition 180dpi as a result. At the time of ******, the printing sequence of ink over all dots is KCMY, and the bright color is printed at the end.

[0012] Next, as shown in drawing 9 B, when the print head 100 ****** in the 2nd direction (drawing Nakaya mark L1 direction), the print head 100 shifts only the specified quantity, and the ink injected from the ink nozzle 101 is printed by horizontal resolution 360dpi and vertical definition 180dpi, and creates level and the swath SWT1 of vertical definition 360dpi by ****** and ****** as a result. In addition, at the time of ******, the printing sequence of ink over all dots is YMCK, and the dark color is printed at the end.

[0013] Furthermore, as shown in drawing 9 C, when the print head 100 ****** in the 1st direction (drawing Nakaya mark R 2-way) again, the print head 100 shifts only the specified quantity further, and the ink injected from the ink nozzle 101 is printed by horizontal resolution 360dpi and vertical definition 180dpi like the above-mentioned, and creates level and the swath SWT2 of vertical definition 360dpi by ****** and ****** as a result. The printing sequence of ink over all the dots at the time of this ****** is KCMY, and an again bright color will be printed at the end.

[0014] If the above-mentioned logical model is seen, since the interlace of light-and-darkness

each lightness is carried out perpendicularly equally by each swath, as for each swath, it seems to have removed color tone change of a contiguity swath by interleave. However, although it is few fields, the so-called dot gain of overwriting a contiguity dot exists in this logical model.
[0015] Dot gain is generated by increasing the diameter, when the ink droplet of a certain magnitude dries on the surface of the matter. This dot gain is required in order to make image quality the optimal, or in order to ensure color saturation. For example, if there is no suitable dot gain, the front face (generally white) of the substrate of a print sheet can be seen from the clearance between a dot and a dot, and, as for a printing image, will look like the so-called "WOSSHUDO out."
[0016] Drawing 10 is drawing for explaining the dot gain in the above-mentioned logical model in detail. As shown in this drawing (a), the low dot D2 of lightness is overwritten on the high dot D1 of lightness, it becomes a dark impression and dot gain when the print head 100 carries out ****** appears in human being's eyes so that printing result 110a may see consequently. Moreover, conversely, as shown in this drawing (b), the high dot D1 of lightness is overwritten on the low dot D2 of lightness, it becomes a bright impression and the dot gain when carrying out ****** whose print head 100 is the 2nd time appears so that printing result 110b may see. As for the image finally printed in such printing actuation, the swath SWT1 when the print head 100 carries out actuation (L1, L2, ..., Ln) to the left from the right looks darkly, and it is said brightly that its swath SWT2 when carrying out actuation (R1, R2, ..., Rn) to the right from the left can be seen. A vertical high resolution is realized by fine interleave of each printing swath, and the inclination which stops being able to be conspicuous easily has color tone change by the printer with more high resolution. However, in such a case, it also sets and color tone change of the band spots between contiguity swaths etc. is still seen.
[0017] This invention was made in view of such a trouble, and aims at offering the ink jet printer which prevents effectively the band spots resulting from change of the order of a color pile when carrying out bidirectional printing, and color tone change.
[0018]
[Means for Solving the Problem] The ink jet head which comes to arrange two or more nozzles which carry out the regurgitation of the ink of a color in which the ink jet printers concerning this invention differ in a main scanning direction, respectively, While driving this ink jet head relatively [direction / of vertical scanning / which intersects perpendicularly with said main scanning direction and this to print media] It has the head control means which outputs the regurgitation pulse for the ink regurgitation to said ink jet head synchronizing with the drive of said ink jet head. In the ink jet printer which lays the ink droplet breathed out from the nozzle of each color of said ink jet head on top of each dot formation location of said print media, and forms a color picture in it Said ink jet head So that the nozzle which carries out the regurgitation of the ink of the brightest color may be located in the lower stream of a river of the nozzle which carries out the regurgitation of the ink of the color of middle lightness even when it moves to which sense of said main scanning direction It comes to arrange at least two or more one side of the nozzle which carries out the regurgitation of the ink of the color of the nozzle which carries out the regurgitation of the ink of said brightest color, and said middle lightness. Said head control means When said ink jet head is moving said main scanning direction to the 1st sense, It becomes the combination from which the nozzle which carries out the regurgitation of the ink of the color of said middle lightness and the brightest color in the time of moving to the 2nd sense opposite to this differs. And the nozzle which carries out the regurgitation of the ink of the color of said middle lightness to the same dot location in any [of said 1st and 2nd sense] case, It is

characterized by being what outputs a regurgitation pulse to said ink jet head so that ink may be breathed out in order of the nozzle which carries out the regurgitation of the ink of said brightest color.

[0019] The following can be considered as an ink jet head of the ink jet printer concerning this invention. That is, even when the 1st ink jet head moves to which sense of said main scanning direction preferably, it comes to arrange in a main scanning direction at least two or more one side of the nozzle which carries out the regurgitation of the ink of the color of the nozzle which carries out the regurgitation of the ink of said darkest color so that the nozzle which carries out the regurgitation of the ink of the darkest color may be located in the upstream of the nozzle which carries out the regurgitation of the ink of the color of middle lightness, and said middle lightness.

[0020] In this case, when said ink jet head is moving said main scanning direction to the 1st sense, after said head control means outputs a regurgitation pulse to the nozzle which carries out the regurgitation of the ink of said darkest color, it is desirable that it is what outputs a regurgitation pulse to the nozzle which carries out the regurgitation of the ink of the color of said middle lightness.

[0021] Moreover, the 2nd ink jet head is a nozzle to which it consists of six head segments on a par with said main scanning direction which consisted of two or more nozzles with which each changed the location of the direction of vertical scanning, and it has 2 sets of two head segments which carry out the regurgitation of the ink of the darkest color and the brightest color, respectively, each class is arranged outside preferably, respectively, and two inside head segments carry out the regurgitation of the ink of the color of middle lightness.

[0022] In this case, as for said head control means, it is desirable that it is what outputs a regurgitation pulse in order of the head segment which carries out the regurgitation of the ink of the darkest color of the group to precede about the same dot formation location, the head segment which carries out the regurgitation of the ink of the color of middle lightness, and the head segment which carries out the regurgitation of the ink of the brightest color of a back group.

[0023] Furthermore, the 3rd ink jet head is a head segment to which it consists of four head segments preferably on a par with said main scanning direction, two head segments which carry out the regurgitation of the ink of the brightest color are arranged outside, respectively, and two inside head segments carry out the regurgitation of the ink of the color of middle lightness.

[0024] In this case, as for said head control means, it is desirable that it is what outputs a regurgitation pulse about the same dot formation location in order of the head segment which carries out the regurgitation of the ink of the color of middle lightness, and the head segment which carries out the regurgitation of the ink of the brightest color behind that.

[0025] As a color of the ink breathed out from the nozzle of the ink jet head of the ink jet printer concerning this invention, it is desirable for said brightest color to be [for the colors of yellow (Y) and said middle lightness] cyanogen (C) and a Magenta (M).

[0026] In addition, for said darkest color, as a color of the ink breathed out from the nozzle of said 1st and 2nd ink jet heads, black (K) and said brightest color may be [the color of yellow (Y) and said middle lightness] cyanogen (C) and a Magenta (M).

[0027] Moreover, as a color of the ink breathed out from the nozzle of said 2nd ink jet head, the darkest color is black (K), and in that case, said head control means outputs a regurgitation pulse by turns to the head segment of the black contained in said each class at the time of monochrome printing, and realizes printing of a twice [at the time of color printing] as many rate as this.

[0028] According to this invention, the array of the ink nozzle of the ink jet head in an ink jet

printer is changed, and it becomes possible to print maintaining the regurgitation sequence of ink to the same dot location by controlling the regurgitation sequence of ink, even when an ink jet head moves in which direction of a main scanning direction. Thereby, the band spots which originate in order of the color pile of ink can be decreased or removed.
[0029]
[Embodiment of the Invention] Hereafter, the example of this invention is explained with reference to a drawing. Drawing 1 is the block diagram showing a part of configuration of the ink jet printer concerning one example of this invention.
[0030] Image data which should be carried out a printout, such as TIFF, JPEG, MR, MMR, CALS, etc. which are sent from the host system which is not illustrated, is supplied to CPU1. By decode processing, color transform processing, gradation processing, etc., the inputted image data is changed into bit map data, and CPU1 memorizes it in the bit map memory 2. The bit map data memorized by the bit map memory 2 are printed out on the print sheet which is not illustrated by the ink jet head 5 driven by control of the head control section 7. The head control section 7 is constituted by the gate array circuit 3, the head mechanical component 4, and the timing fence section 6. The gate array circuit 3 outputs the timing signal for a head drive to the head mechanical component 4. The head mechanical component 4 drives a print sheet in the direction (the direction of vertical scanning) which intersects perpendicularly with a main scanning direction while driving the ink jet head 5 in the direction (main scanning direction) which crosses a print sheet based on this timing signal. The timing fence section 6 detects the location of the ink jet head 5 including a linear encoder, and the ink jet head 5 outputs the timing fence signal TP to the gate array circuit 3, whenever only the specified quantity moves to a main scanning direction. The gate array circuit 3 outputs a timing signal to the head mechanical component 4 based on this timing fence signal TP. The gate array circuit 3 outputs the regurgitation pulse FP which gives the regurgitation timing of ink to the ink jet head 5 again based on the timing fence signal TP.
[0031] Drawing 2 is drawing for explaining the motion of the ink jet head 5 to a print sheet 20.
[0032] The both-way drive of the ink jet head 5 is carried out in the main scanning direction of a print sheet 20. A print sheet 20 drives in the direction of vertical scanning, respectively at the time of termination of ****** of the ink jet head 5, and termination of ******. The ink jet head 5 consists of two or more head segment 5a which carries out the regurgitation of the ink of a different color together with a main scanning direction. One head segment 5a consists of two or more nozzle 5b which carries out the regurgitation of the ink of the same color, as shown in drawing 3 . Although you may stand in a line in the direction of vertical scanning at the single tier, in order to make arrangement of a nozzle easy, like illustration, these nozzle 5b changes one nozzle of locations of a main scanning direction at a time, and is arranged in the shape of a hound's-tooth check.
[0033] Drawing 4 is drawing showing the 1st example of a configuration and its example of a drive of the ink jet head 5 in this equipment.
[0034] As shown in this drawing (a), this ink jet head 5 consists of two head segment group 5C 5C [1 and]2 located in a line with the main scanning direction. One head segment group 5C1 consists of three head segment 5a (K1, Y2, C3) which carries out the regurgitation of the ink of each color of KYC. Head segment group 5C2 of another side consists of three head segment 5a (M4, Y5, K6) which carries out the regurgitation of each color of MYK. In addition, each head segment 5a can be driven independently, respectively. 3 color combined head in which each has three head segment 5a is sufficient as head segment group 5C 5C [1 and]2. when the ink jet

head 5 moves in the direction of drawing Nakaya mark L (the left from the right -- migration: -- it is hereafter called about L lines.), as shown in discharge and this drawing (b), the lap of ink prints [the head segments K1, C3, M4, and Y5] KCMY for ink on a print sheet 20 in order.
[0035] on the other hand, when moving in the direction of drawing Nakaya mark R (the right from the left -- migration: -- it is hereafter called about R lines.), the head segments K6, M4, C3, and Y2 perform ink in order, and discharge and the lap of ink print KMCY. usually, color tone change in which the combination (for example, as green as red) of a specific color was conspicuous at the time of bidirectional printing -- a lifting -- easy -- when also using the black (K) ink of still few amounts, it turns out that especially this phenomenon becomes remarkable. It follows, for example, the ink jet head of the conventional KCMY array is used, and the way which prints KCMY and KMCY by turns using the ink jet head 5 of a configuration like this example can say that color tone change becomes what is not conspicuous rather than printing by turns in order of KCMY and YMCK. That is, it is possible to be able to make color tone change of a contiguity swath into the minimum, and to remove color tone change over [almost] a total color by preventing reversing the color sequence of K and Y in a printing result.
[0036] In addition, the above is an example of 6 head segmental die, and can find out the same view for other examples of arrangement. For example, it consists of three head segment 5a (Y1, K2, C3) to which segment group 5C1 carries out the regurgitation of the ink of each color of YKC like drawing 5 (a). Even if segment group 5C2 consists of three head segment 5a (M4, K5, Y6) which carries out the regurgitation of the ink of each color of MKY In order, on the other hand, the head segments K2, C3, M4, and Y6 are not conspicuous [in ink / as for color tone change] by about L lines, like the case of the 1st example of the above, when head segment K5, and M4, C3 and Y1 carry out the regurgitation of the ink to sequence by about R lines, discharge and.
[0037] Moreover, it consists of three head segment 5a (K1, Y2, C3) to which segment group 5C1 carries out the regurgitation of the ink of each color of KYC like drawing 5 (b) similarly. Even if segment group 5C2 consists of three head segment 5a (M4, K5, Y6) which carries out the regurgitation of the ink of each color of MKY By about L lines, as for color tone change, the head segments K1, C3, M4, and Y6 are not conspicuous, when head segment K5, and M4, C3 and Y2 make ink sequence and they make the regurgitation of the ink to sequence by discharge and about R lines.
[0038] In addition, as shown in drawing 6 , at the time of monochrome printing, it enables a drive of only the head segments K1 and K6 of the ink jet head 5 of drawing 4 , moves the ink jet head 5 on a frequency twice the rate of the ink regurgitation, and since the ink jet head 5 of 6 head segmental die mentioned above has head segment 5a of two K colors in the main scanning direction, it impresses a regurgitation pulse to it so that K1 and K6 may be operated by turns every other dot. Thereby, monochrome (monochrome) printing is usually attained at twice [about] as many high speed as a print speed.
[0039] in this case -- the time of about R lines [in / as shown in this drawing (a) / printing actuation] -- K6 carries out [a head K1] the regurgitation of the ink for ink to an even-dot train in that opposite dot train at an odd-dot train, respectively in the case of about L lines, as shown in discharge and this drawing (b), respectively. For example, what is necessary is just to arrange two print heads in one train so that one head may print an odd-dot train and another head may print an even-dot train in order to print with the nozzle pulse frequency of 8kHz (a 8000-/second / nozzle) of horizontal resolution 360dpi and to make this passing speed quick, although the passing speed (Head Transport Speed:HTS) of an ink jet head should just be 22.2 inches/second.

High-speed monochrome printing with the passing speed of 44.4 inches/second can be carried out by impressing a pulse to K1 and K6 by turns using the result, for example, the above-mentioned model. However, using an ink jet head with equal number of ink jet nozzles and spacing of a nozzle, this approach can be realized, only when each nozzle has a drive circuit.
[0040] Drawing 7 is drawing showing other example of a configuration and its example of a drive of the ink jet head 5 in this equipment.
[0041] As shown in this drawing (a), this ink jet head 5 consists of four head segment 5a (Y1, C2, M3, Y4) which carries out the regurgitation of the ink of each color of YCMY. Usually, in many low-price ink jet printers, one compound print head with four print heads with the nozzle train of a single tier or four independent nozzle segments is equipped, the ink of C, M, Y, and K is mounted, and KCMY printing is performed. However, in the case where a photograph, a computer artwork, etc. are generated, the ink of K can completely say the need that there is nothing so that a raster image may be generated. In fact, the standard model of subtractive color mixture is the color of CMY, and is not CMYK. Although color of K is added for upgrading of a text print, an improvement of image contrast, etc., the approach of this example is devised in order to realize suitable balance of image quality and a print speed, after taking into consideration image upgrading by the color of K, and degradation of the image quality by the color tone error at the time of bidirectional printing.
[0042] As shown in this drawing (a), when the ink jet head 5 moves to about L lines, as shown in discharge and this drawing (b), the lap of ink prints [the head segments C2, M3, and Y4] CMY for ink on a print sheet 20 in order. On the other hand, when moving to about R lines, as shown in discharge and this drawing (b), the lap of ink prints [the head segments M3, C2, and Y1] CMY for ink on a print sheet 20 in order. Consequently, the optimal bidirectional printing in the ink jet head 5 of a configuration of consisting of four print heads which do not carry the ink of K becomes possible.
[0043] In addition, the configuration of the ink jet head of the ink jet printer in this invention is not limited to what was mentioned above. For example, it consists of four head segment 5a (K1, C2, M3, Y4) to which one [as shown in drawing 8 (a)] head segment group 5C1 carries out the regurgitation of the ink of each color of KCMY. What [consists of four head segment 5a (Y5, M6, C7, K8) to which head segment group 5C2 of another side carries out the regurgitation of the ink of each color of YMCK] What consists of seven head segment 5a (K1, C2, M3, Y4, M5, C6, K7) which carries out the regurgitation of the ink of each color of KCMYMCK as shown in this drawing (b), Or it could consist of seven head segment 5a (Y1, M2, C3, K4, C5, M6, Y7) which carries out the regurgitation of the ink of each color of YMCKCMY as shown in this drawing (c). Moreover, you may consist of five head segment 5a (C1, M2, Y3, M4, C5) which carries out the regurgitation of the ink of each color of CMYMC as shown in this drawing (d) also as a configuration of the ink jet head 5 in which K is not carried, for example. What is necessary is in short, just to carry out two or more arrangement of the head segment which carries out the regurgitation of the ink of either the color of middle lightness, and the brightest color. It cannot be overemphasized that various ink jet head configurations can be considered from the above thing if it is the range which does not deviate from the summary of this invention.
[0044]
[Effect of the Invention] As stated above, according to this invention, the ink nozzle array of an ink jet printer is changed, and the effectiveness that the band spots and color tone change

resulting from change of the order of a color pile when carrying out bidirectional printing can be effectively prevented by controlling regurgitation sequence is done so.

EFFECT OF THE INVENTION

[Effect of the Invention] As stated above, according to this invention, the ink nozzle array of an ink jet printer is changed, and the effectiveness that the band spots and color tone change resulting from change of the order of a color pile when carrying out bidirectional printing can be effectively prevented by controlling regurgitation sequence is done so.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram showing a part of configuration of the ink jet printer concerning one example of this invention.
[Drawing 2] It is drawing for explaining the motion of an ink jet head to the print sheet in this equipment.
[Drawing 3] It is drawing showing the example of arrangement of the nozzle of the ink jet head in this equipment.
[Drawing 4] It is drawing showing the 1st example of a configuration and its example of a drive of the ink jet head in this equipment.
[Drawing 5] It is drawing showing the example of arrangement of other head segments of the ink jet head in this equipment.
[Drawing 6] It is drawing showing the example of a drive at the time of monochrome printing with the ink jet head in this equipment.
[Drawing 7] It is drawing showing other example of a configuration and its example of a drive of the ink jet head in this equipment.
[Drawing 8] It is drawing showing the example of a configuration of further others of the ink jet head in this equipment.
[Drawing 9 A] It is drawing showing the logical model in the case of carrying out interleave printing with the conventional ink jet printer.
[Drawing 9 B] It is drawing showing the logical model in the case of carrying out this interleave printing.
[Drawing 9 C] It is drawing showing the logical model in the case of carrying out this interleave printing.
[Drawing 10] It is drawing of a ****** sake in detail about the dot gain in this logical model.
[Description of Notations]
1 [-- A head mechanical component 5 / -- An ink jet head, 6 / -- The timing fence section, 7 / -- A head control section, 100 / -- Print head.] -- CPU, 2 -- Bit map memory, 3 -- A gate array, 4

CLAIMS

[Claim(s)]
[Claim 1] The ink jet head which comes to arrange two or more nozzles which carry out the regurgitation of the ink of a color which is different in a main scanning direction, respectively, While driving this ink jet head relatively [direction / of vertical scanning / which intersects

perpendicularly with said main scanning direction and this to print media] It has the head control means which outputs the regurgitation pulse for the ink regurgitation to said ink jet head synchronizing with the drive of said ink jet head. In the ink jet printer which lays the ink droplet breathed out from the nozzle of each color of said ink jet head on top of each dot formation location of said print media, and forms a color picture in it Said ink jet head So that the nozzle which carries out the regurgitation of the ink of the brightest color may be located in the lower stream of a river of the nozzle which carries out the regurgitation of the ink of the color of middle lightness even when it moves to which sense of said main scanning direction It comes to arrange at least two or more one side of the nozzle which carries out the regurgitation of the ink of the color of the nozzle which carries out the regurgitation of the ink of said brightest color, and said middle lightness. Said head control means When said ink jet head is moving said main scanning direction to the 1st sense, It becomes the combination from which the nozzle which carries out the regurgitation of the ink of the color of said middle lightness and the brightest color in the time of moving to the 2nd sense opposite to this differs. And the nozzle which carries out the regurgitation of the ink of the color of said middle lightness to the same dot location in any [of said 1st and 2nd sense] case, The ink jet printer characterized by being what outputs a regurgitation pulse to said ink jet head so that ink may be breathed out in order of the nozzle which carries out the regurgitation of the ink of said brightest color.

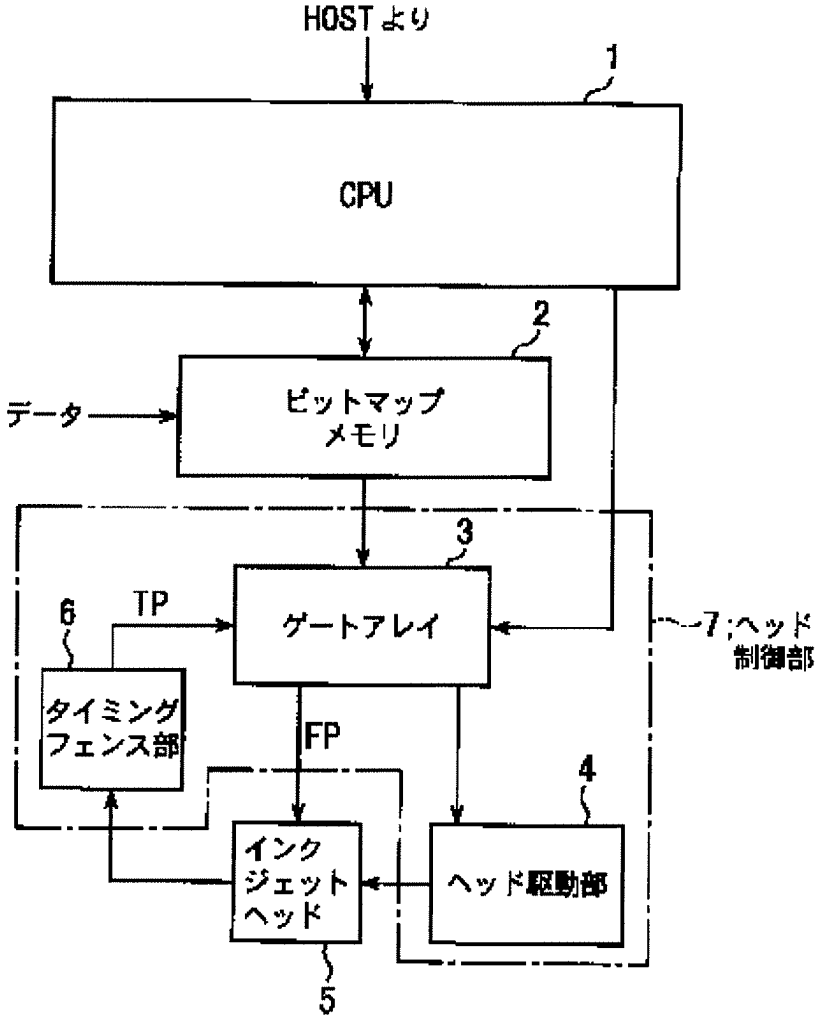
[Claim 2] Said ink jet head So that the nozzle which carries out the regurgitation of the ink of the darkest color may be located in the upstream of the nozzle which carries out the regurgitation of the ink of the color of middle lightness even when it moves to which sense of said main scanning direction It comes to arrange in a main scanning direction at least two or more one side of the nozzle which carries out the regurgitation of the ink of the color of the nozzle which carries out the regurgitation of the ink of said darkest color, and said middle lightness. Said head control means As opposed to the nozzle which carries out the regurgitation of the ink of said darkest color when said ink jet head is moving said main scanning direction to the 1st sense The ink jet printer according to claim 1 characterized by being what outputs a regurgitation pulse to the nozzle which carries out the regurgitation of the ink of the color of said middle lightness after outputting a regurgitation pulse.

[Claim 3] Said ink jet head consists of six head segments on a par with said main scanning direction which consisted of two or more nozzles with which each changed the location of the direction of vertical scanning. It has 2 sets of two head segments which carry out the regurgitation of the ink of the darkest color and the brightest color, respectively. It is the nozzle to which each class is arranged outside, respectively and two inside head segments carry out the regurgitation of the ink of the color of middle lightness. Said head control means The head segment which carries out the regurgitation of the ink of the darkest color of the group to precede about the same dot formation location, The ink jet printer according to claim 2 characterized by being what outputs a regurgitation pulse in order of the head segment which carries out the regurgitation of the ink of the color of middle lightness, and the head segment which carries out the regurgitation of the ink of the brightest color of a back group.

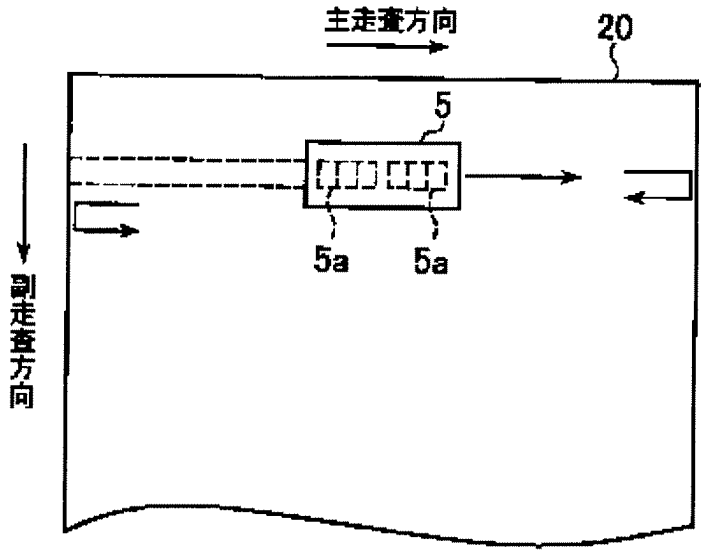
[Claim 4] Said ink jet head consists of four head segments on a par with said main scanning direction. Two head segments which carry out the regurgitation of the ink of the brightest color are arranged outside, respectively. Two inside head segments are head segments which carry out the regurgitation of the ink of the color of middle lightness. Said head control means The ink jet printer according to claim 1 characterized by being what outputs a regurgitation pulse about the same dot formation location in order of the head segment which carries out the regurgitation of

the ink of the color of middle lightness, and the head segment which carries out the regurgitation of the ink of the brightest color behind that.
[Claim 5] The ink jet printer of claims 1-4 given in any 1 term with which said brightest color is characterized by the colors of yellow (Y) and said middle lightness being cyanogen (C) and a Magenta (M).
[Claim 6] The ink jet printer according to claim 2 or 3 with which said darkest color is characterized by black (K) and said brightest color being [the color of yellow (Y) and said middle lightness] cyanogen (C) and a Magenta (M).
[Claim 7] It is the ink jet printer according to claim 3 characterized by being what outputs a regurgitation pulse by turns to the head segment of the black by which said darkest color is black (K) and said head control means is included in said each class at the time of monochrome printing, and realizes printing of a twice [at the time of color printing] as many rate as this.

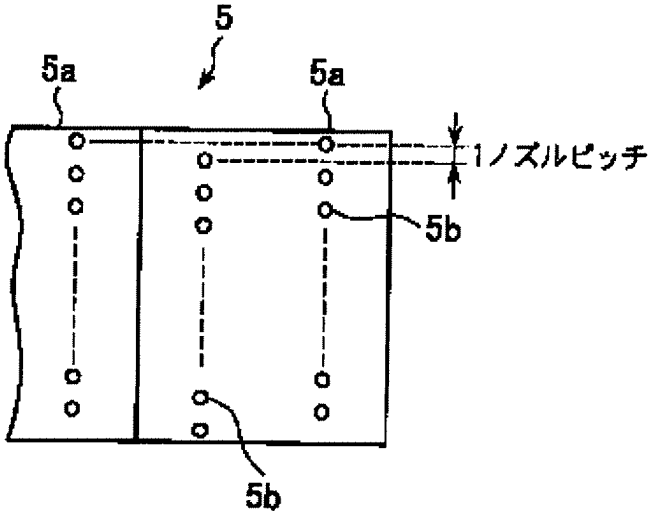
[Drawing 1]


HOSTより
1
CPU
2
データ
ビットマップ
メモリ
3
6
TP
ゲートアレイ
7;ヘッド
制御部
タイミング
フェンス部
FP
4
インク
ジェット
ヘッド
ヘッド駆動部
5

[Drawing 2]

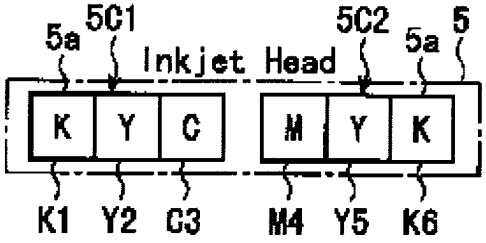


[Drawing 3]



[Drawing 4]

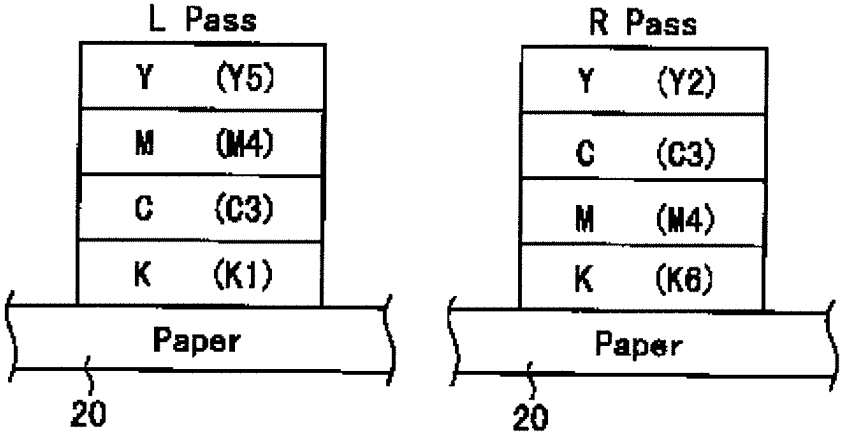
(a)



Printing Order

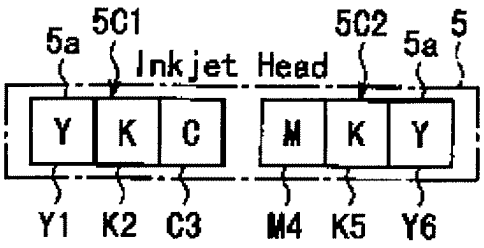
Pass	1	2	3	4
← L	K1	C3	M4	Y5
R →	K6	M4	C3	Y2
Pass	1	2	3	4

(b)



[Drawing 5]

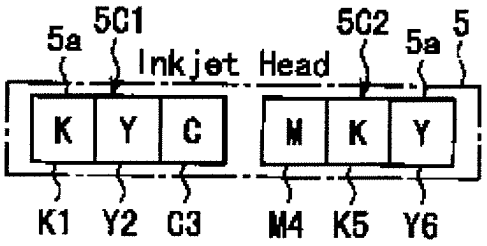
(a)



Printing Order

Pass	1	2	3	4
← L	K2	C3	M4	Y6
→ R	K5	M4	C3	Y1
Pass	1	2	3	4

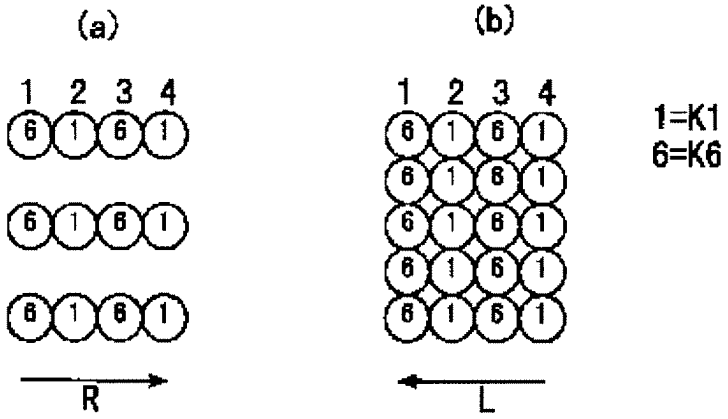
(b)



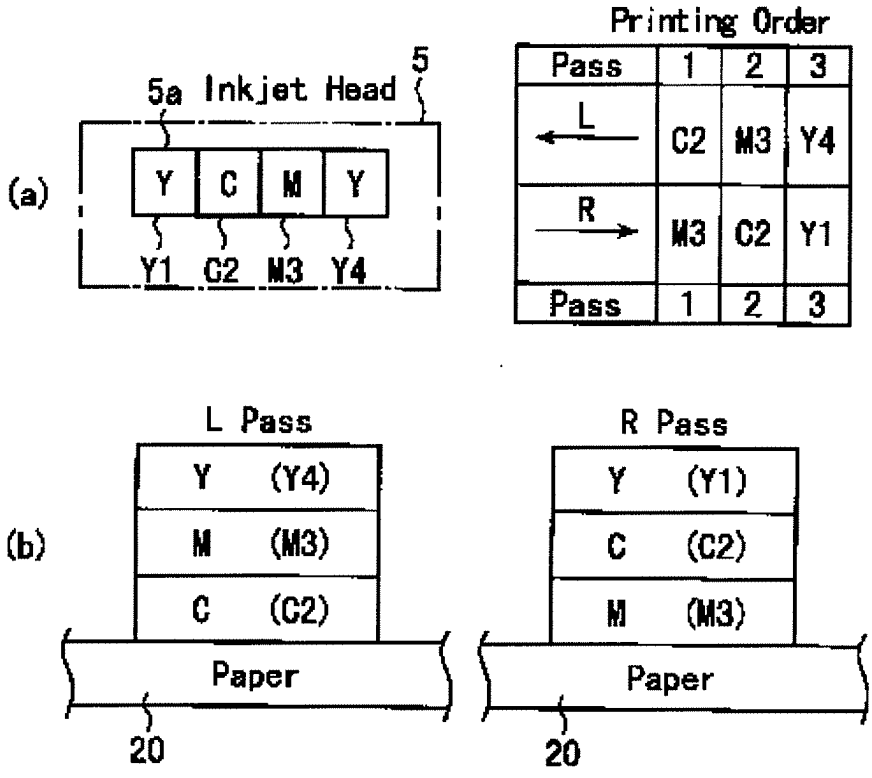
Printing Order

Pass	1	2	3	4
← L	K1	C3	M4	Y6
→ R	K5	M4	C3	Y2
Pass	1	2	3	4

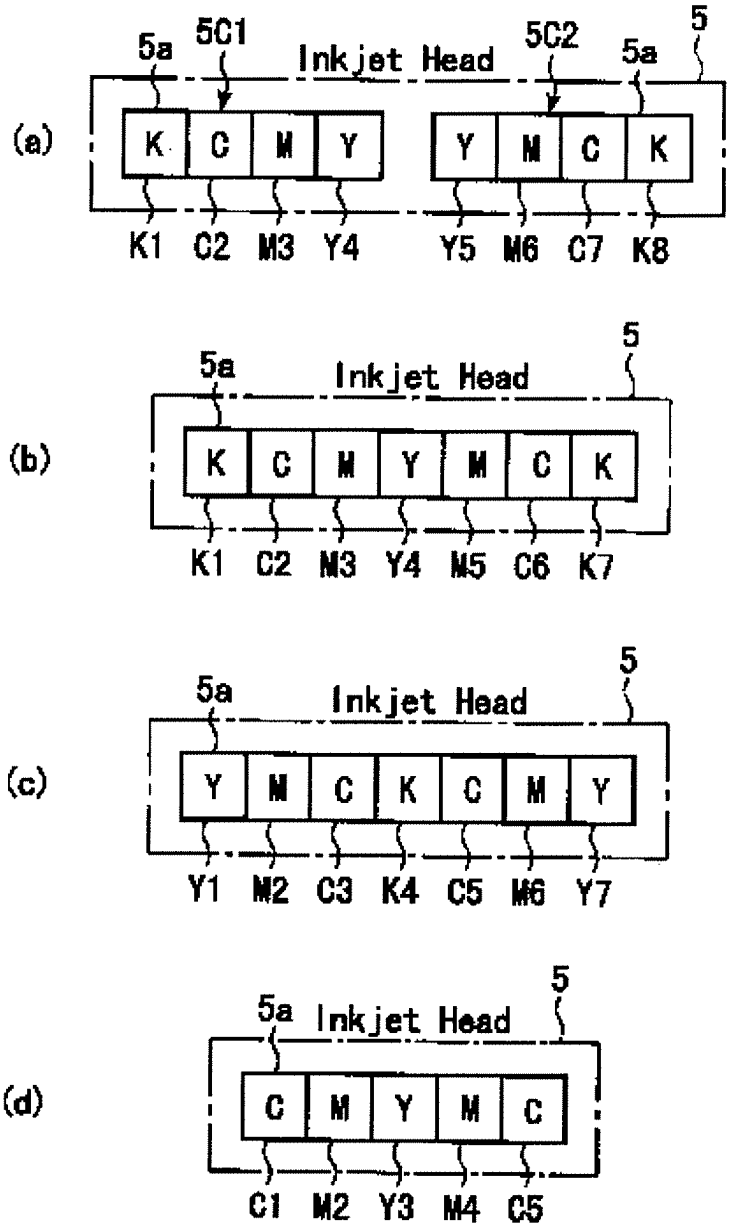
[Drawing 6]



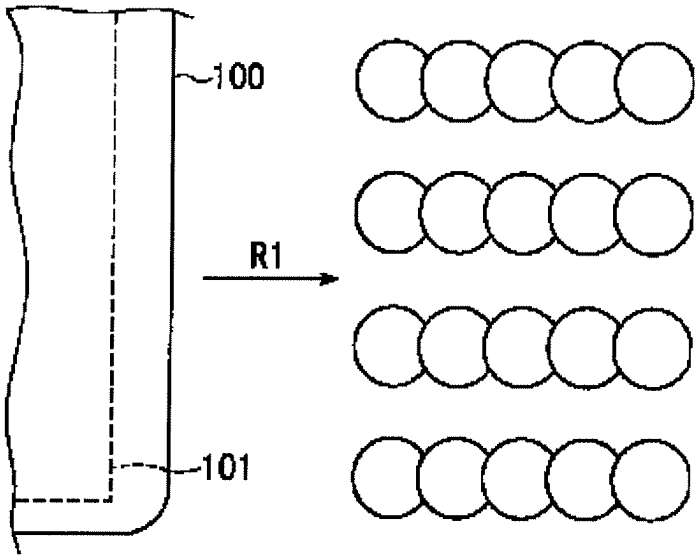
[Drawing 7]



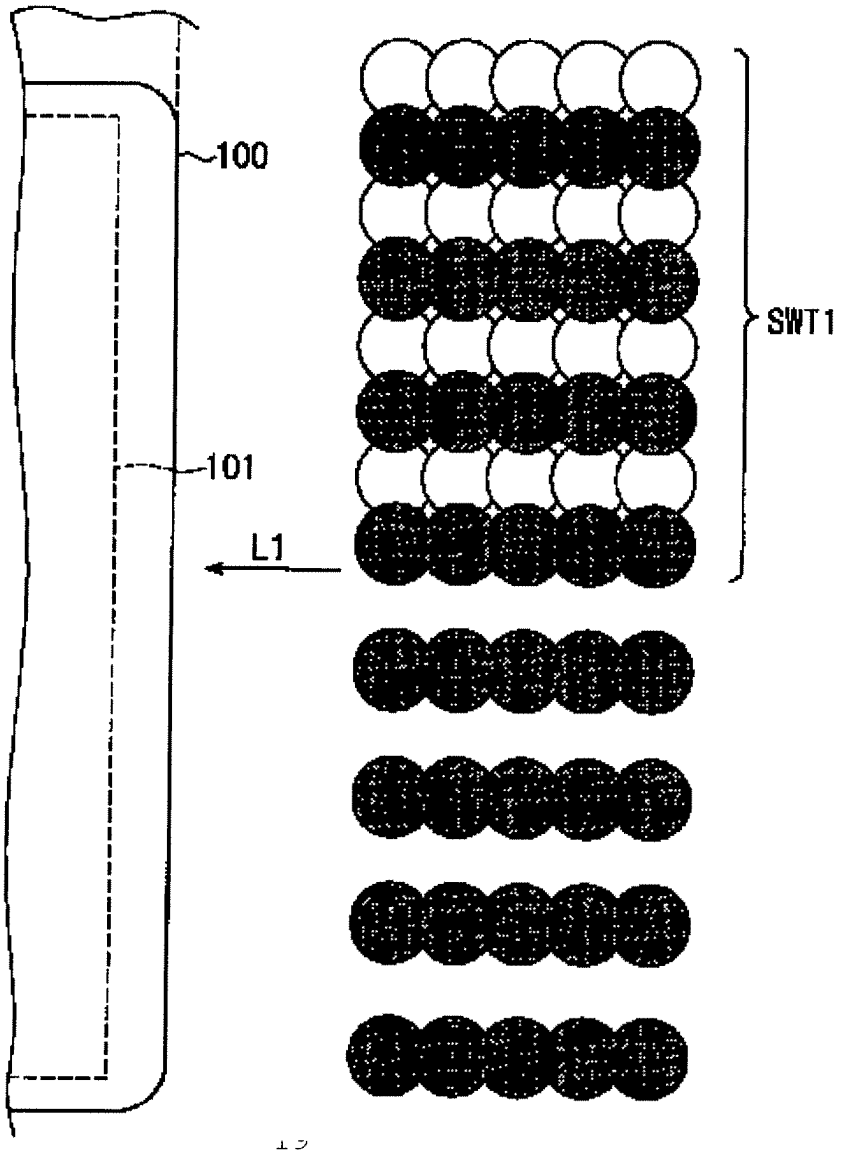
[Drawing 8]


(a)
5a
5C1
Inkjet Head
5C2
5a
5
K C M Y Y M C K
K1 C2 M3 Y4 Y5 M6 C7 K8
(b)
5a
Inkjet Head
5
K C M Y M C K
K1 C2 M3 Y4 M5 C6 K7
(c)
5a
Inkjet Head
5
Y M C K C M Y
Y1 M2 C3 K4 C5 M6 Y7
(d)
5a
Inkjet Head
5
C M Y M C
C1 M2 Y3 M4 C5

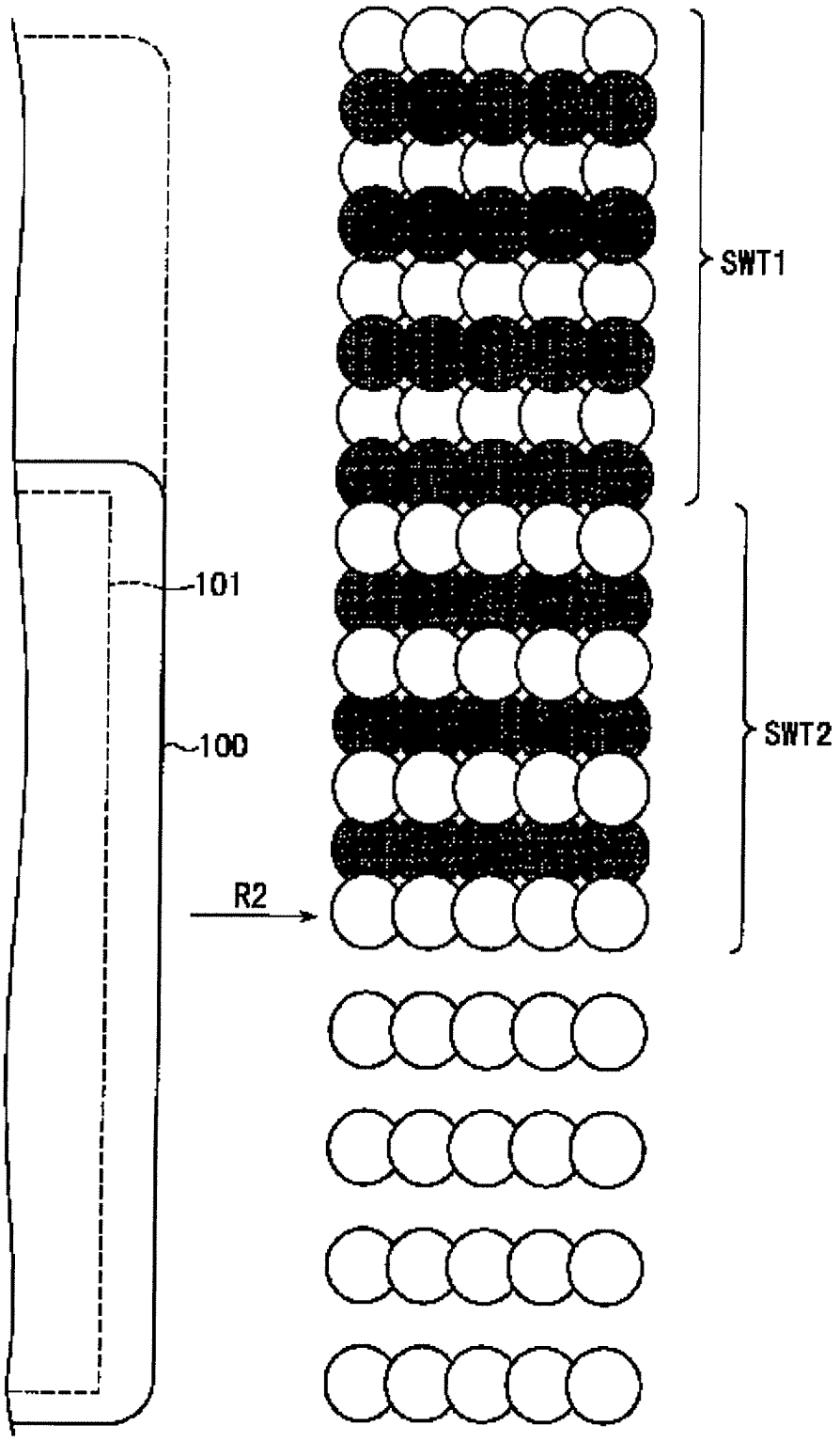
[Drawing 9A]



[Drawing 9B]



[Drawing 9C]



[Drawing 10]